Paper id: 252528

Subject Code: KCA205

Roll No: | | | | | | | | | | | | | |

MCA

(SEM II) THEORY EXAMINATION 2024-25

DATA STRUCTURES & ANALYSIS OF ALGORITHMS

TIME: 3 HRS **M.MARKS: 100**

Note: Attempt all Sections. In case of any missing data; choose suitably.

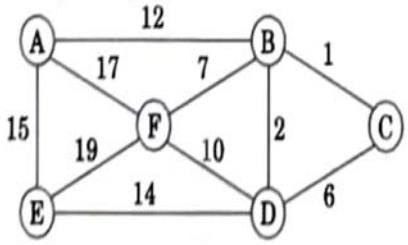
SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Q No.	Question	CO	Level
a.	What is Theta (Θ) notation used for?	1	K1
b.	If A[3][4]is stored in column-major order and each element takes 2 bytes, what is the address of A[1][2] if the base address is 500?	1	K1
c.	How is tail recursion different from normal recursion?	2	K2
d.	A linear queue is implemented using an array Q[5]. If front=1 and rear=3, how many elements are in the queue?	2	K2
e.	How many passes are required to sort an array of 5 elements using bubble sort?	3	K1
f.	What is an adjacency matrix?	3	K1
g.	List the three main types of binary tree traversals	4	K3
h.	How does a B-Tree differ from a binary search tree?	4	K2
i.	How many comparisons are needed in quick sort to sort an array of 5 distinct elements in the worst case?	5	K1
j.	What is the key difference between Bellman-Ford and Dijkstra's algorithms?	5	K1

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

Q No.	Question	CO	Level
a.	A 2D array B[6][5] is stored in column-major order. The base address is 2000, and each element occupies 2 bytes. (i) Derive the index formula to find the address of B[i][j] in column-major order. (ii) Use this formula to calculate the address of B[4][3]. (iii) Compare the memory location of B[4][3] in column-major vs. row-major order.	1	K2
b.	What is a circular queue? How does it overcome the limitations of a linear queue? Write C functions (or full program) for the following operations in a circular queue (using array) (i) Enqueue (ii) Dequeue	2	K2
c.	What is Selection Sort? Write the algorithm and its C implementation. Sort the array [20, 12, 10, 15, 2] step-by-step using Selection Sort.	3	K1
d.	Insert the following keys into an initially empty AVL Tree: 20, 4, 15, 70, 50, 100, 80. Perform the following tasks: • Show the tree after each insertion. • Identify the type of rotation applied (if any). • Show the final balanced AVL Tree.	4	K3
e.	Define spanning tree. Also, construct a minimum spanning tree using Prim's algorithm for the given graph. 	5	K4

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SECTION C

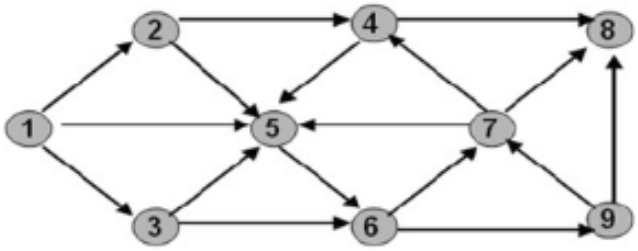
3. Attempt any *one* part of the following: 10 x 1 = 10

a.	How to represent the polynomial using linked list? Write a C program to add two polynomials using linked list.	1	K2
b.	What are the various asymptotic notations? Explain Big O notation.	1	K1

4. Attempt any *one* part of the following: 10 x 1 = 10

a.	Write algorithm for Push and Pop operations in stack. Transform following expression into its equivalent postfix expression using stack: A+ (B*C – (D/E**F) *G) *H	2	K2
b.	What is Hashing? Explain division method to compute the hash function and also explain the collision resolution strategies used in hashing.	2	K3

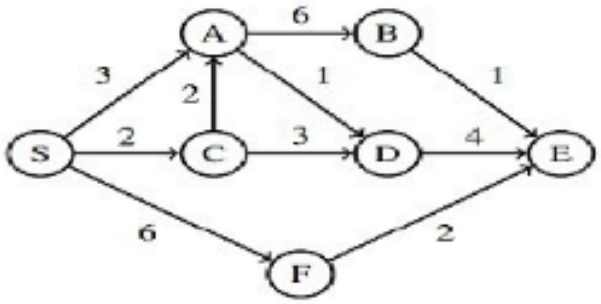
5. Attempt any *one* part of the following: 10 x 1 = 10

a.	Compare adjacency matrix and adjacency list representations of a graph.	3	K3
b.	Differentiate between DFS and BFS. Draw the breadth First Tree for the graph. 	3	K3

6. Attempt any *one* part of the following: 10 x 1 = 10

a.	Draw a binary tree with the following traversals: Inorder: BCAEGDHFIJ Preorder: ABCDEGFHIJ	4	K2
b.	What is a Threaded Binary Tree? Explain the advantages of using Threaded Binary Tree.	4	K1

7. Attempt any *one* part of the following: 10 x 1 = 10

a.	Explain Strassen's matrix multiplication concept with an example, derive its time complexity.	5	K4
b.	Write the Dijkstra algorithm for shortest path in a graph and also find the shortest path from 'S' to all remaining vertices of graph in the following graph: 	5	K3